the effects of soil, cultivation and manuring, seed rate, variety, time and methods of sowing, and size of grain are considered.

One can but regret that it is not followed by a chapter on quality, in which the effects of these factors on the milling and baking properties of the bread wheats is brought under review. Such a chapter would be peculiarly welcome to both wheat-breeders and millers, even if it did no more than summarise the scattered literature on the subject. It would, moreover, go some way to justify the statement on the wrapper of the book that it is " essential to . . . plant-breeders and millers." Prof. Percival will lay workers on both these subjects under a still greater obligation if such an addition is made when a new edition of this useful volume is called for. R. H. B.

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## The Subjectivity of Psychology.

*The Psychology of Everyday Life.* By Dr. James Drever. Pp. ix + 164. (London: Methuen and Co., Ltd., 1921.) 6*s*. net.

THE present generation is witnessing a sustained and persistent effort to raise psychology to the status of a science. Hitherto it has been a part of philosophy, and it is felt by psychologists that success depends wholly on their being able to detach it. There is something curiously instructive in the fact that the task is avowedly difficult. It is curious because the data of psychology are more immediate than any other data of science, and for that reason alone we should expect them to be the most easily known and the most susceptible to treatment. But the instructive thing is that this very intimacy of our relationship with the data militates against scientific treatment. All the trouble in regard to the matter arises from the fact that the objects of a science of psychology are more difficult to abstract from the subject of experience, more difficult to reify or set up with an independent status of their own, than are the objects of any recognised science, mathematical, physical, or biological.

This is obvious at once if we compare psychology with its nearest neighbour in the hierarchy, physiology. We have no trouble in presenting the functions of anatomical organs, and the processes of secretion, circulation, innervation, and the like, as objective. They are capable of mechanistic interpretation in complete detachment from anything which depends on the experience of the subject, although we are ready to acknowledge that without such experience the apparent purpose of the mechanism would be wanting. But when we try in the same way to present instincts, impulses, emotions, feelings, memory, wishes, trains of reasoning, we seem to be in a peculiar difficulty, for it is impossible to avoid not merely subjectivity, but a certain vexatious personal and individual subjectivity. Yet there is no obvious reason for this, and the more we reflect the more we are driven to recognise that while we know as matter of fact that it is so, we do not know and are unable to imagine the reason why it should be so.

The difficulty goes back at least to Berkeley. It is quite easy to imagine perfect cubes and circles and other geometrical figures existing entirely independently of the mind which knows them and to found a science on the assumption that they may or do so exist. The same is true in some measure of all the physical and biological sciences. But a wish, a pain, a thought, absolutely refuse to be detached, and will not let us imagine an abstract existence for them independently of the subject. Now Berkeley's contention was that every object of knowledge is in the same case, and therefore the physical sciences have no advantage over psychology. This, however, gives no satisfaction to the modern psychologist, for whatever be the truth of Berkeley's doctrine he knows that physics and biology possess at least a *practical* advantage which is lacking to psychology.

The little manual by Dr. Drever, which is the occasion of this reflection, is an excellent classification and general survey of the nature of the entities with which the modern science of psychology is attempting to deal. What seems to qualify the author for his task is his thorough knowledge of the older and philosophical treatment of the subject, in particular with its treatment in books like Descartes's " Les Passions de l'Ame " and Malebranche's " Recherche de la Vérité." Dr. Drever is in thorough sympathy with the scientific end, and is working towards it, yet with full consciousness and complete understanding of its origin in philosophy.

H. Wildon Carr.

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## The Study of Earthquakes.

*A Manual of Seismology.* By Dr. Charles Davison. (Cambridge Geological Series.) Pp. xii + 256. (Cambridge: At the University Press, 1921.) 21*s*. net.

TIME was when the meaning of seismology was clear and unmistakable; it was the study of earthquakes, and by earthquakes was meant the disturbance which could be felt, and, when severe, caused alarm and damage. It was known that there was a central area where the earthquake was most severe, fringed by zones of decreasing violence, until a region was reached where it was insensible to the unaided senses, though still recognisable by suitable

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instruments, and when, towards the end of last century, it was found that, at distances far away from the region affected by the sensible shock, disturbances which were clearly connected with great earthquakes could be detected by suitable instruments, it was natural to suppose that the origin was the same for both. Only of recent years has it been recognised that the earthquake proper, caused directly by fracturing of the surface rocks, is but a secondary effect of a more deep-seated disturbance, or bathyseism, which, and not the earthquake proper, is presumably the origin of the disturbance represented in the preliminary tremors of the distant record.

Meanwhile, seismology has developed on two distinct lines, and in reality into two distinct sciences, differing in method, means, and requirements. On one hand, we have the newer seismology of the long-distance record, in which personal observation counts for nothing; some mechanical ingenuity is required for the design of efficient instruments, some care in the maintenance of them and their records, but after that, the discussion and interpretation are purely a matter of the higher mathematics. On the other hand, we have the older seismology, in which there is still much work to be done, even with no further mathematical equipment than an intelligent schoolboy may carry away from a modern public school, but in which the collection of data is entirely dependent on personal observation, and the coincidence of occasion and a competent observer.

With such a difference of scope and methods, it is scarcely possible for one individual to become a master of both branches, and this is illustrated by the existence of two recent text-books, both nominally of seismology; first we have the "Modern Seismology" of the late Dr. G. W. Walker, which appeared some years ago and is an admirable introduction to the newer development of the subject, but scarcely refers, and only incidentally, to the earthquake proper; then we have this book, by Dr. C. Davison, which is called a manual of seismology and devotes only a part of one chapter to the subject of Dr. Walker's book. The difference accounts for, and is indicated by, the fact that one appeared as a Monograph on Physics, the other as part of the Cambridge Geological Series.

The object, as well as the scope, of Dr. Davison's work accounts sufficiently for the fact that he devotes only part of a chapter to the newer seismology, and the treatment is adequate, in so far as it gives that amount of information which a student of the older seismology cannot afford to ignore. As a manual of that older seismology the book fills a much-felt want, for we had no satisfactory introduction to the study of the earthquake proper. Well arranged and clearly expressed, the only adverse criticism which can be made is that the ground is possibly too fully covered, and that some matters which might have been omitted from an introductory text-book have necessarily received too brief a treatment; but this fault—if such it be—is counteracted by the references to other works in which the subject is more fully dealt with. These references to previous literature add very greatly to the value of the work; not large in number, they are very judiciously selected, form a satisfactory basis for advanced study in all branches of the subject, and, without exception, are such that no one wishing for a mastery of the subject could afford to leave them unstudied. R. D. O.

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## Chemical and Physical Constants.

*Handbook of Chemistry and Physics. A Ready-Reference Pocket Book of Chemical and Physical Data.* By Prof. C. D. Hodgman, assisted by Prof. M. F. Coolbaugh and Cornelius E. Senseman. Eighth edition. Pp. 711. (Cleveland, Ohio: Chemical Rubber Company, 1920.) 3 dollars.

THIS compact little volume contains a vast array of chemical and physical constants. Since the first publication in 1914 it has passed through eight editions in the United States—a sufficient proof of its utility as "a comparatively comprehensive reference book for use in the laboratory or classroom."

The tables on the properties of inorganic and organic compounds are very complete, and chemists will appreciate particularly the tabular information on the solubility of inorganic salts in water. The data on the "Dehydration of Metallic Sulphates" and the "Decomposition of Anhydrous Metallic Sulphates" are distinctly novel features. In the qualitative analysis scheme it is somewhat difficult to follow out the behaviour of chromium. A very complete table is given of heats of formation and solution, but it is to be regretted that no indication is given as to the sources from which the data have been compiled.

The section devoted to physics is fairly complete, and one notes with pleasure that the table for the reduction of psychrometric observations refers to the ventilated type of wet and dry bulb thermometer only. At the end of the volume eight pages are devoted to problems, the utility of which in a book of data is doubtful.

The book has some blemishes, for the most trustworthy data have not always been chosen. To take one example only, in the table of "Fixed Points for High Temperatures" the melting point of nickel is given as 1427° and that of platinum as 1775°. Ten years ago the Carnegie Institution published a memoir on High Temperature Gas Thermometry, and the values

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